

Bioenergy in California

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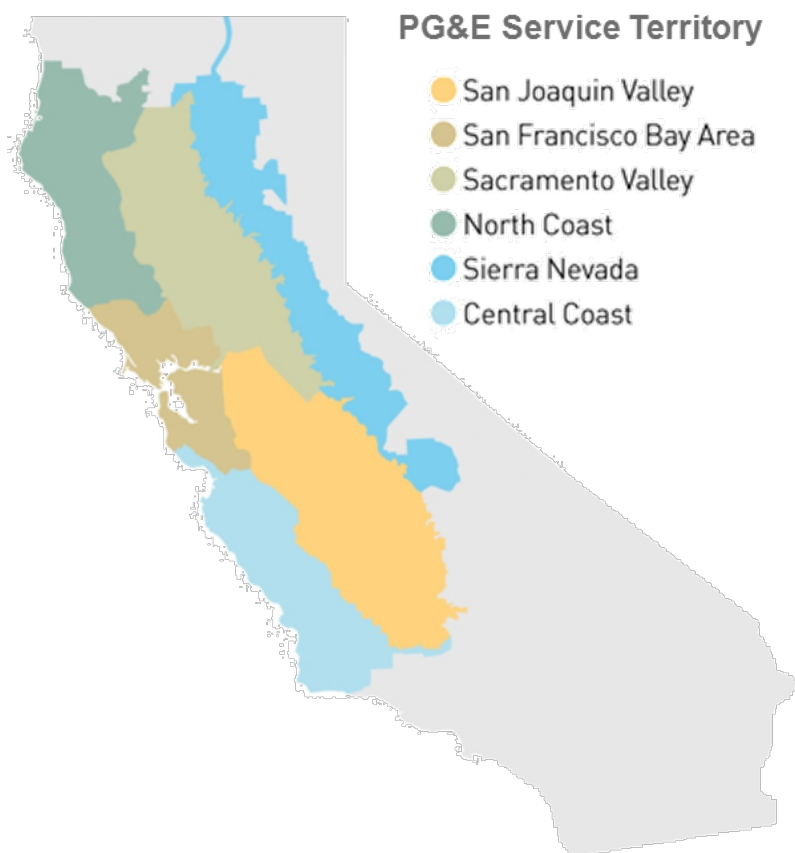




Outline

- RPS Compliance: Past, Present, and Future
- Procurement Opportunities for Bioenergy
- Challenges to Bioenergy Deployment

PG&E's Mission is to Provide Safe, Reliable and Affordable Energy to Northern & Central California



Company Facts

- Fortune 200 company located in San Francisco, CA
- 20,000+ employees

Energy Supply

- Serves 15M people:
 - 5.2M electric accounts
 - 4.3M natural gas accounts
- Peak electricity demand: 20,000 MW

Service Territory

- 70,000 sq. miles across the California landscape
- 160,000 circuit miles of electric transmission and distribution lines
- 49,000 miles of natural gas transmission and distribution pipelines



Executed RPS Contracts (excluding Feed-in Tariff contracts)

141 RPS contracts totaling over 10,400 MWs, since the program began in 2002^(1,2)

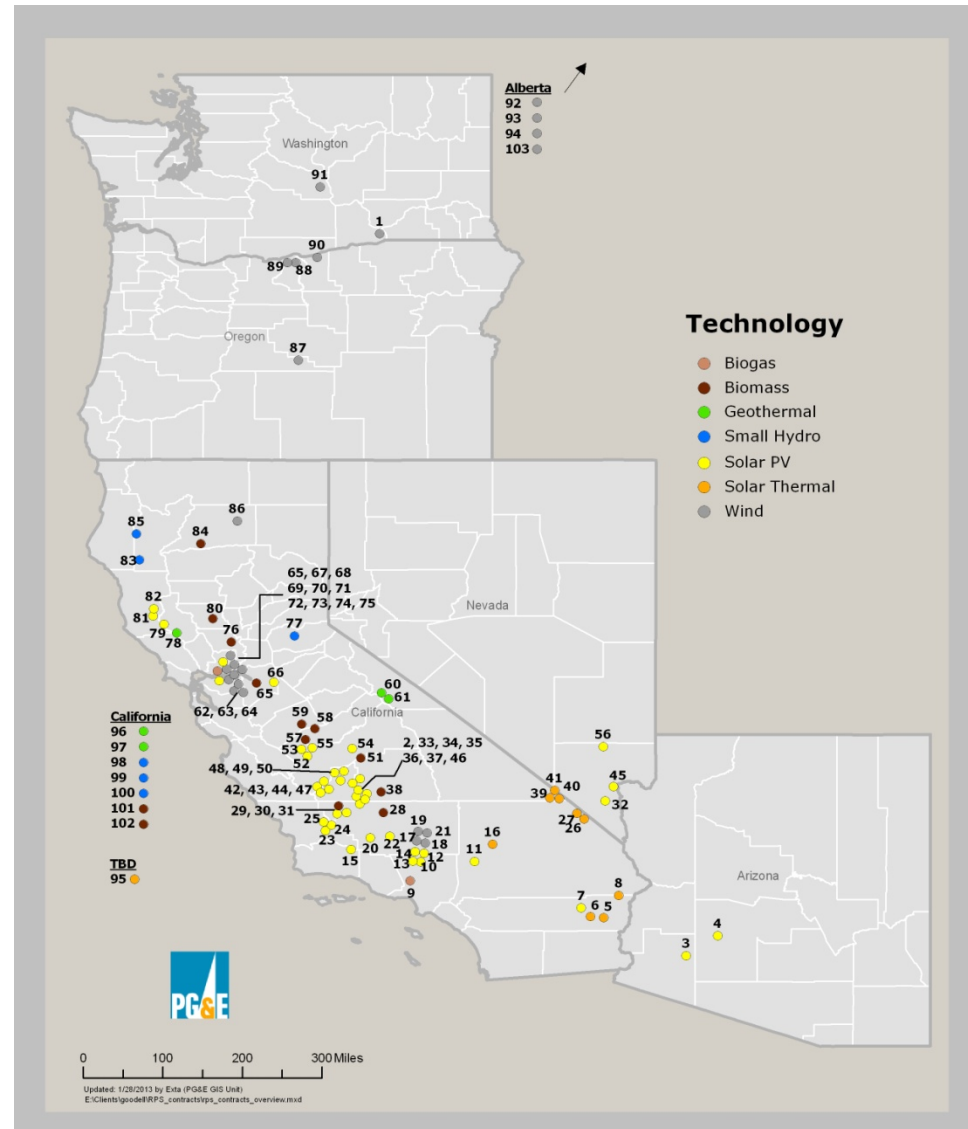
Technology	#	MW
Bioenergy	23	351
Geothermal	10	769
Small Hydro	8	146
Solar PV	45	2,929
Solar Thermal	14	2,755
Wind	40	3,467
Wave	1	2
Total	141	10,418

¹Table does not include small (less than 1.5 MW) renewable generator PPAs and 5 amended post-2002 Qualifying Facility contracts (QF contracts total MW = 56 MW)

²Table includes terminated/expired/rejected contracts which are excluded in the map

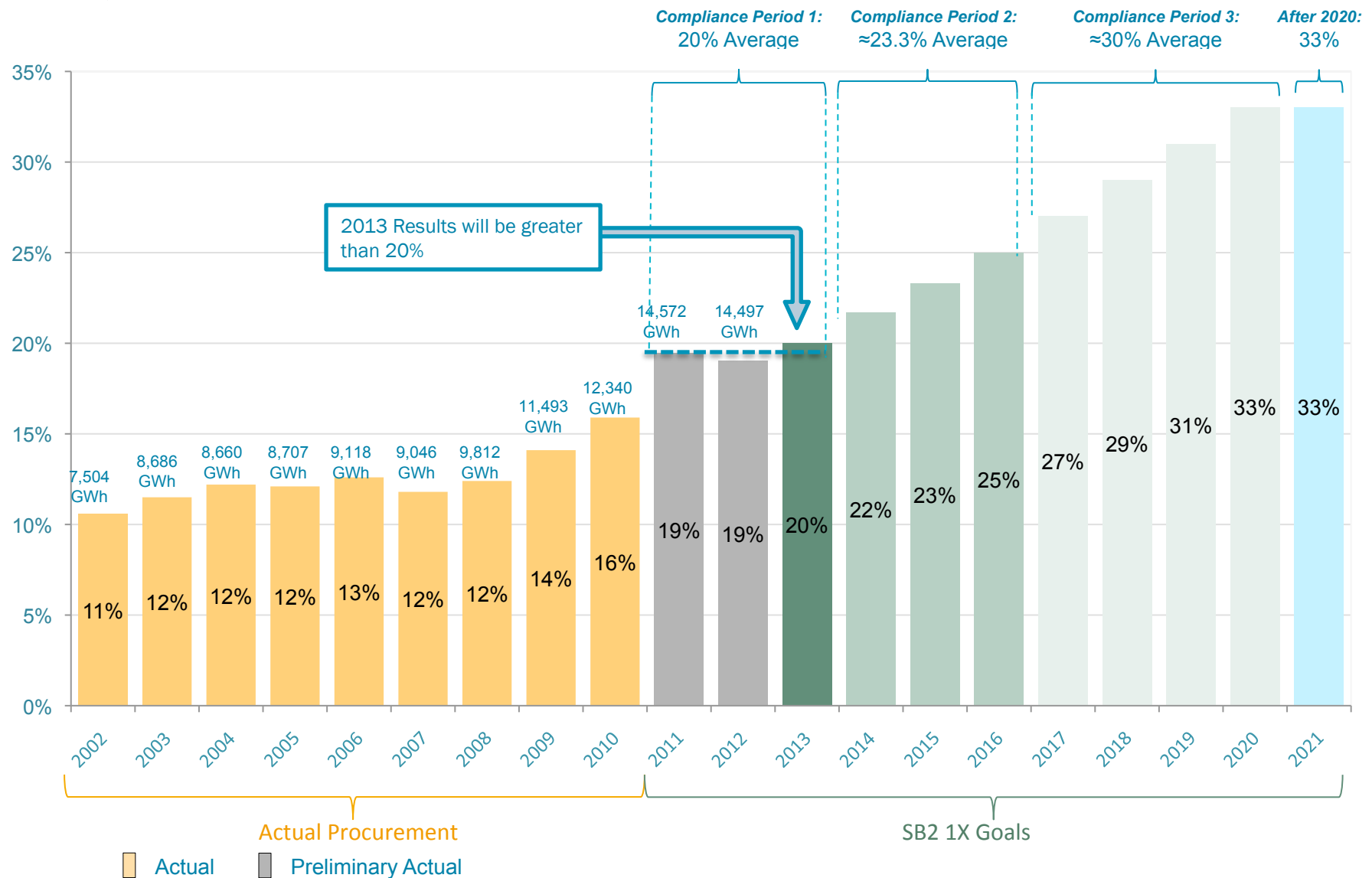
³Bioenergy includes biomass, biogas and landfill gas

Note: Data tables current as of March 06, 2013; map current as of January 16, 2013.





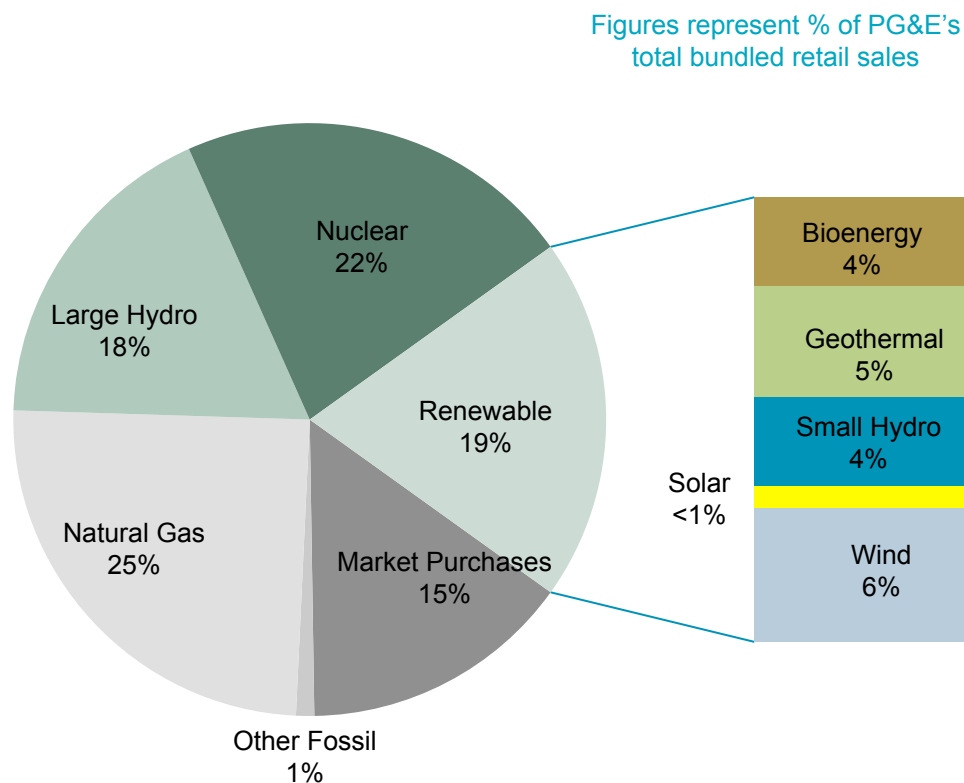
RPS Compliance: Past, Present, and Future



Notes: All percentages are rounded to nearest whole number; last updated on March 8, 2013

2011 Power Mix

	PG&E Preliminary 2011 Power Mix	PG&E 2010 Power Mix	PG&E 2009 Power Mix
Eligible Renewable	19%	15.9%	14.4%
Bioenergy	4%	4%	4%
Geothermal	5%	5%	4%
Small Hydroelectric	4%	3%	3%
Solar PV	<1%	<1%	<1%
Solar Thermal	0%	0%	0%
Wind	6%	4%	3%
Nuclear	22%	24%	21%
Large Hydroelectric	18%	17%	13%
Natural Gas + Other Fossil	26%	25%	35%
Market Purchases	15%	18%	16%
TOTAL	100%	100%	100%



“Market Purchases” is non-auditable electricity purchased from the market and generally reflects energy mix of the Western United States

Sources: <http://www.pge.com/about/environment/pge/cleanenergy/> and PG&E's Energy Compliance and Reporting department as of May 31, 2012

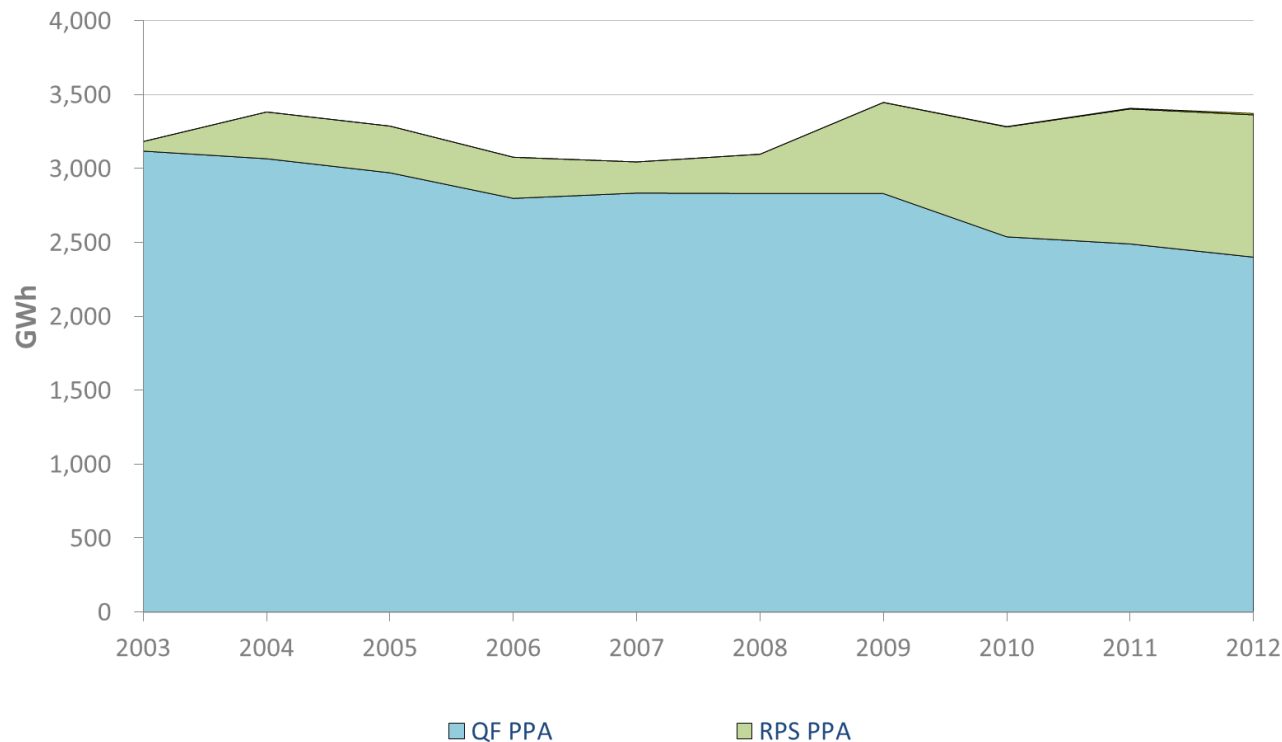
Note: The 2012 preliminary will be reported during second Quarter 2013



PG&E is Major Buyer of Bioenergy Given Our Size and Location

- Bioenergy deliveries represent a large and consistent historical portion of PG&E's RPS portfolio.
- PG&E purchased 3,373 GWh of Bioenergy in 2012, **representing 4.4%** of PG&E's bundled retail energy sales. (*10K Report*)

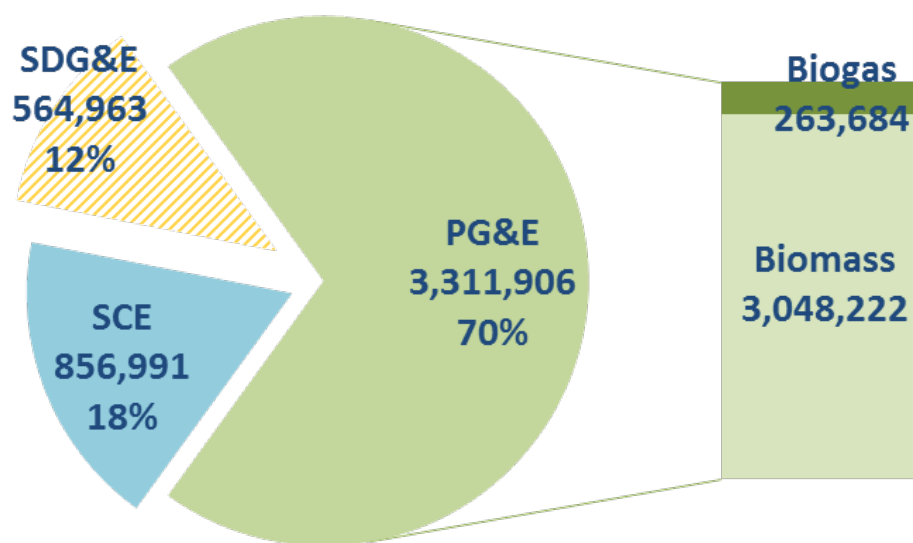
PG&E Bioenergy Generation (GWh)



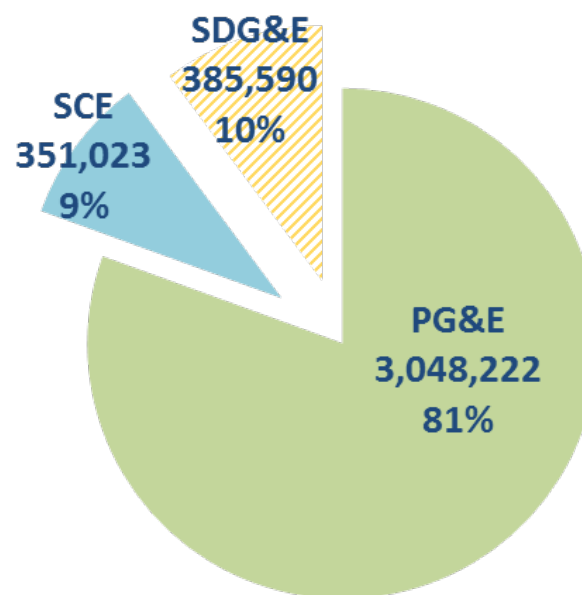


PG&E Procures 70% of all Bioenergy and 81% of all Biomass Contracted to IOUs in CA

2011 Bioenergy Production by California Utility (MWh)

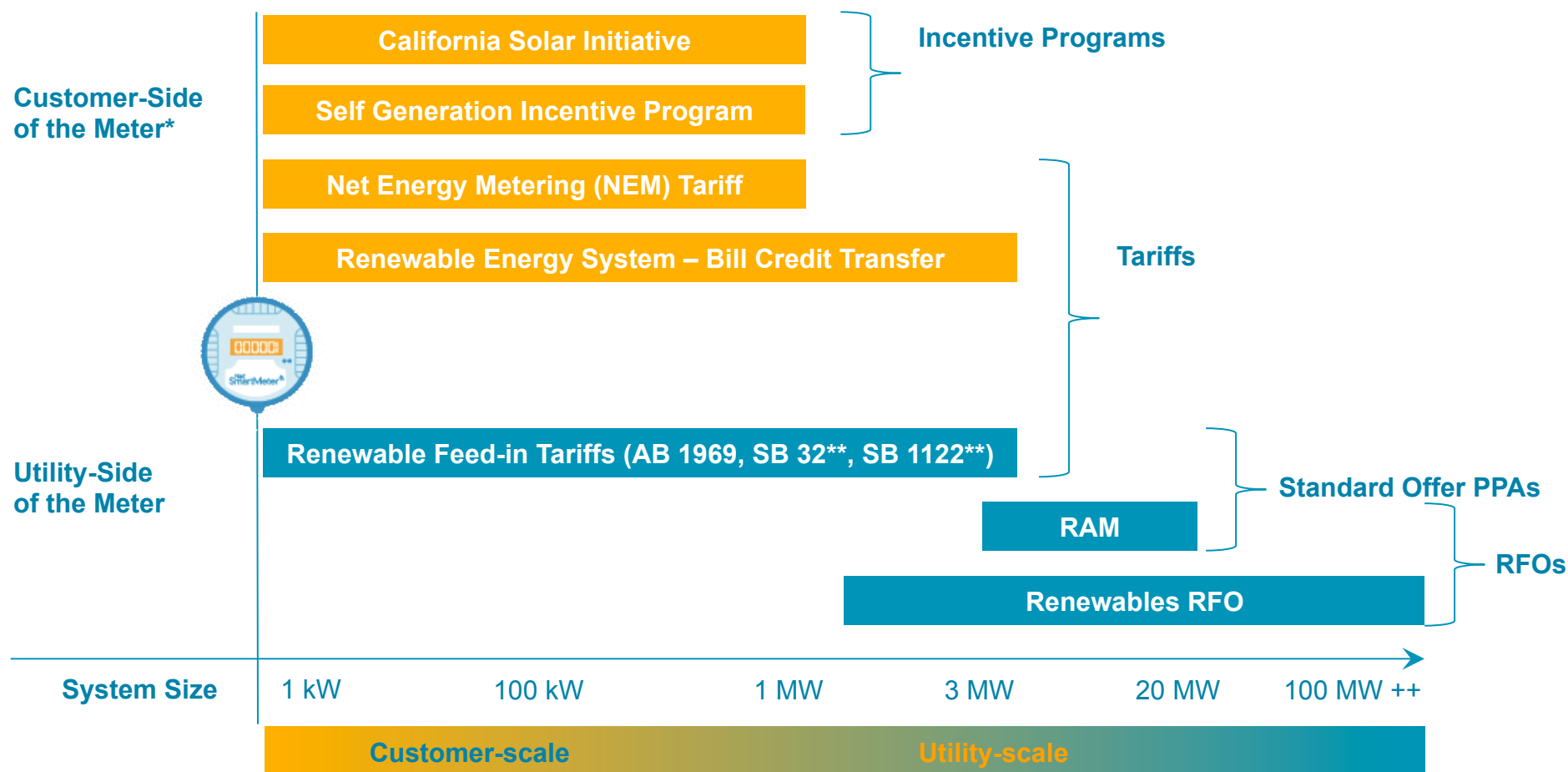


2011 Biomass Production by California Utility (MWh)





Multiple Transaction Opportunities in the Renewable Energy Sector



*Programs do not count towards RPS generation

** Programs currently in regulatory proceedings



Challenge to Deploying Bioenergy

- **Prices**
- **Value of Baseload Capacity**
- **Societal Benefits**

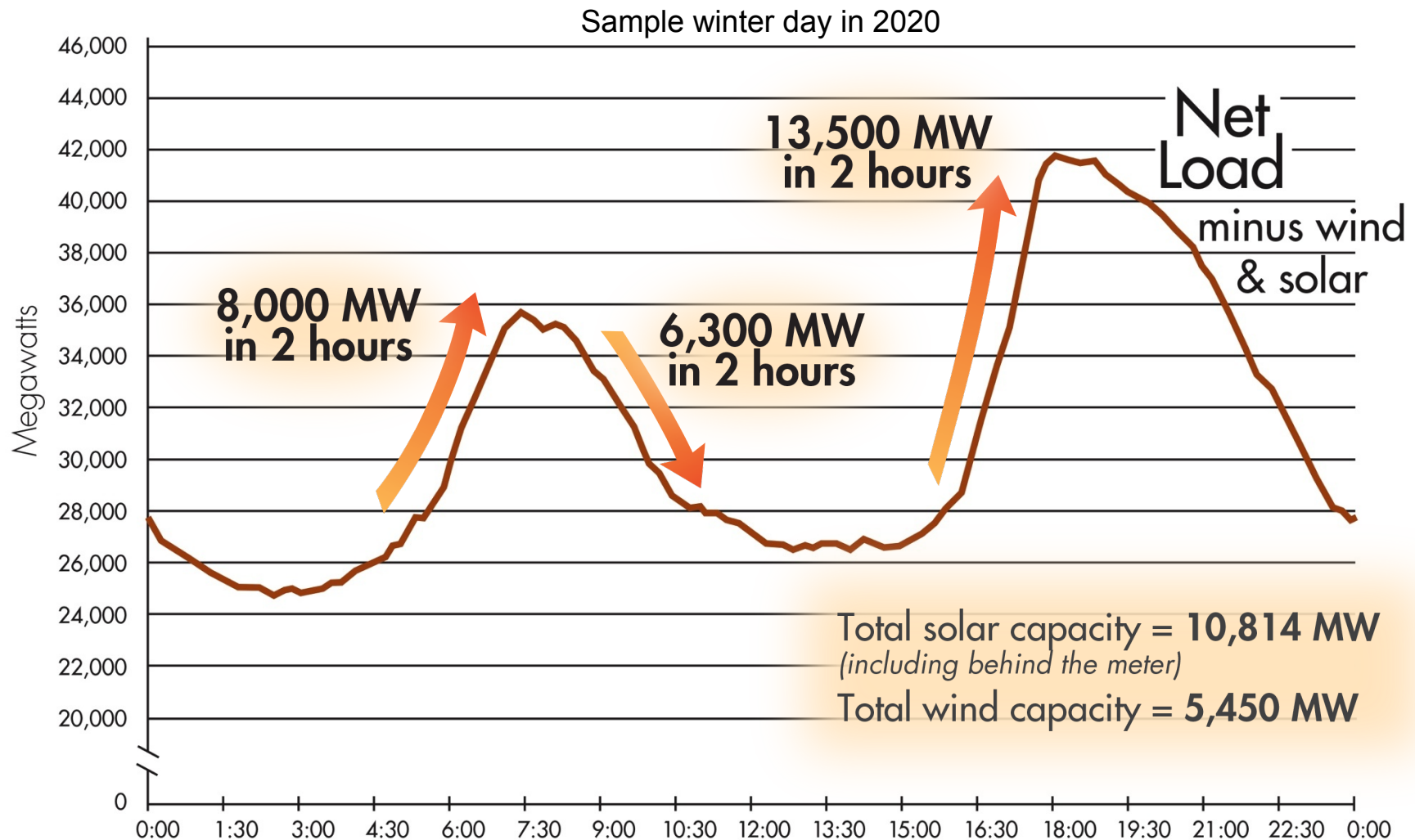


Prices: Bioenergy Prices Higher Than Alternative Renewable Energy

- Recent auctions have resulted in executed, weighted average PPA price of less than \$90/MWh (*CPUC Quarterly Report, March 2013*)
- Levelized cost of electricity (LCOE) for Solar PV has dropped 62% since 2004 (*Bloomberg New Energy Finance*)
- Black & Veatch report indicates average blended price in the \$120 - \$185/MWh range with the overall range between \$80 - \$709/MWh (*Black and Veatch report, pg. 1-1 and pg. 1-5*)



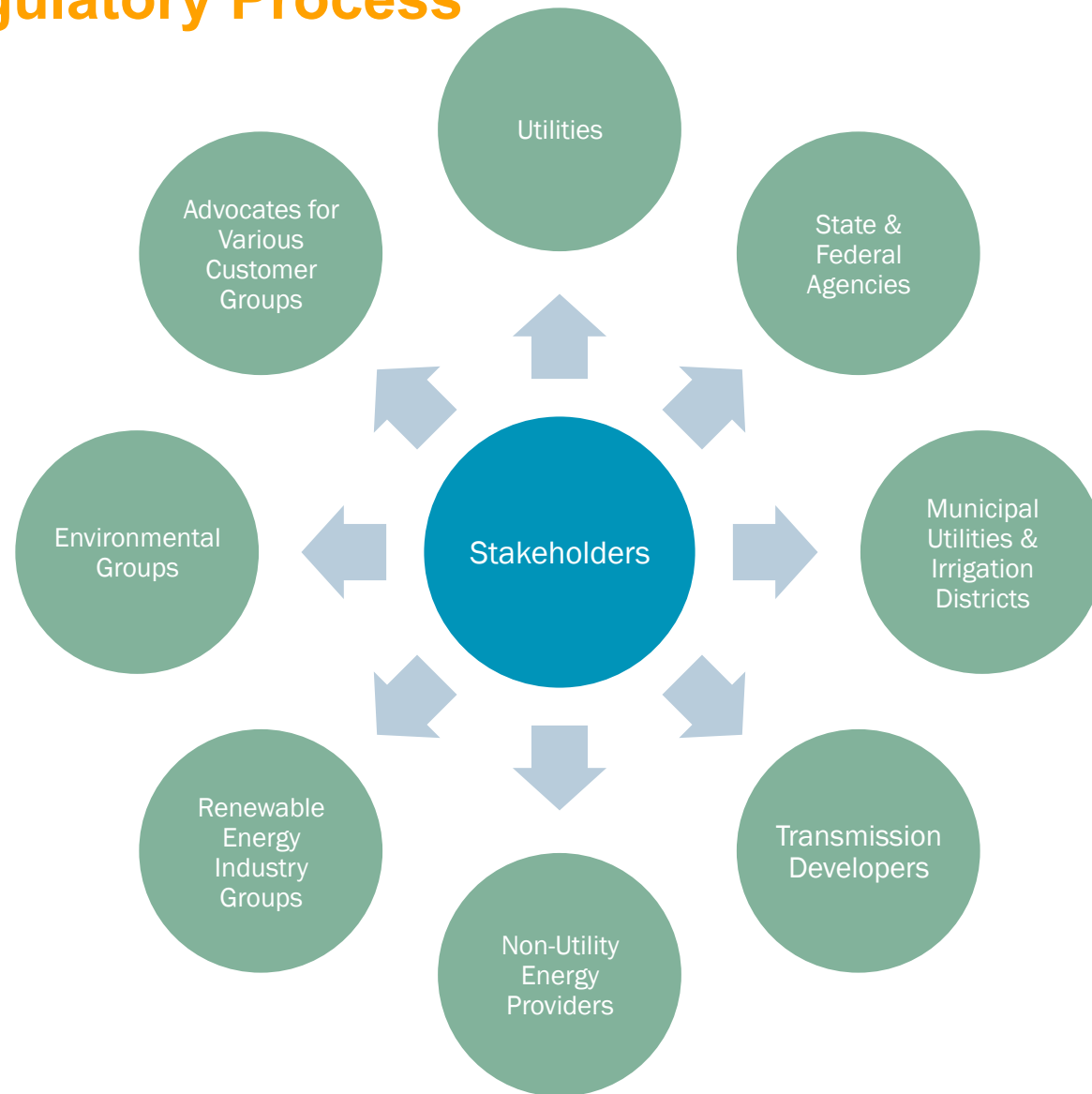
Value of Baseload Capacity: Intermittency Driving Need for Flexible Capacity



Source: Adapted from California ISO presentation on December 20, 2012



Societal Benefits: Major Stakeholders in the RPS Regulatory Process





Summary

- PG&E is on track towards meeting the 33% RPS target and bioenergy has been a significant part of this success
- Many solicitation avenues are currently available for bioenergy
- Price and value should be considered